# ANNUAL REPORT

OF THE

# OREGON AGRICULTURAL COLLEGE

AND

# EXPERIMENT STATION

FOR THE YEAR ENDING

## JUNE 30, 1901.

AGRICULTURAL COLLEGE PRINTING OFFICE
GEO. B. KEADY, PRINTER.
1901.

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# ANNUAL REPORT

OF THE

# OREGON AGRICULTURAL COLLEGE AND EXPERIMENT STATION.

## REPORT OF THE PRESIDENT OF THE BOARD OF REGENTS.

CORVALLIS, OREGON, July 17, 1901.

*To His Excellency, T. T. Geer, Governor of Oregon:*

SIR:—I have the honor of reporting the work of the State Agricultural College and Experiment Station for the year ending June 30, 1901. By the Act of the Legislative Assembly of the State of Oregon, approved October 21, 1870, Corvallis College in Benton County, Oregon, was designated and recognized as the Agricultural College of the State of Oregon. At that time this institution was under the control and management of the Methodist Episcopal Church South. And it continued to control and manage this College until July, 1888.

Under the provisions of the Act of the Legislative Assembly of the State of Oregon, approved February 11, 1885, and as amended November 21, 1885, this College passed from the control of the Methodist Church South in July, 1888, to the present Board of Regents, consisting of nine members appointed by the Governor and confirmed by the Senate. The Governor, Secretary of State, State Superintendent of Public Instruction, and the Master of the State Grange are members of said Board of Regents. This is therefore the thirty-first annual report of this College. Eighteen years of this time it was under the control and management of the above named organization. This is the thirteenth annual report of the work of this College since it came immediately under the control of the State of Oregon. While the work of this College has been annually reported, I trust it will not appear inappropriate for me to make the following statement of facts: There have been graduated at this College one hundred and sixty-two (162) women and two hun-

dred and thirty-four (234) men, making a total of three hundred and ninety-six (396) who have graduated at this school. Of these, twenty-nine (29) women and sixty-one (61) men were graduated prior to July, 1888, leaving one hundred and thirty-three (133) women and one hundred and seventy-three (173) men who have completed the full course and graduated since the Board of Regents have had control of this State institution. It appears that all of the graduates except sixteen are now living. Twelve men and four women have died.

The three hundred and eighty living graduates are a small per cent of the living monuments of the work of this College. The number, who, from some cause, are unable to continue through a complete course of educational work at this school and graduate is quite large. Take, for instance, the freshman class of four years ago, consisting of one hundred and fifty-seven, while there was graduated of this number this year but thirty-four. This will convey some faint idea as to the number of young men and young women who have to drop out of this work, with say one, two or at most three years' training at this College. Still each of these pupils and the people of the State are clearly under obligations to this institution for the preparation and knowledge that has been imparted to each of these young people.

Under the provisions of the Act of the Legislative Assembly of the State of Oregon, approved February 25, 1889, the work of the Experiment Station was placed under the control and management of the Board of Regents of the State Agricultural College. This is the thirteenth annual report of this branch of the work. This class of investigation and research is of great and growing importance to the people of this State and Nation. Oregon has not made any specific appropriation for this class of investigation. The work in the past has been carried on principally by the annual appropriation made by Congress under the provisions of the Hatch Act of March 2, 1887. The experiment work of this Station during the year just closed is of that class and character as to justify me in reporting that it has been undoutedly the most profitable and successful year's experimental work that we have ever had. Those who have by their able and faithful labors contributed to this success are justly entitled to the commendation of all persons interested in the upbuilding and development of the resources of this great State. This branch of the work and the money expended in carrying it on

under the laws of Congress are regarded and held to be distinct from that of the College or educational branch of the work. Hence it is not to be reckoned as a part of the expenditure of the College in determining the cost per scholar.

This has been a very pleasant and profitable year's work in the history of this institution. In fact, the College and Station have never been conducted and managed more successfully. It is creditable to those in charge of this branch of the great educational system of our people. They have justly earned and are justly entitled to commendation for the able and efficient manner in which they have conducted the work of this College and Station. This school and its management are being appreciated and sustained by the people of the State. It is and should be the great agricultural and industrial school of the State of Oregon.

During the year there were enrolled four hundred and thirty-six students. This is the largest number of students that have been enrolled during any previous year. And it is indicative of the growing popularity of this school with the people of the State. The cost per scholar during the year has been eighty-eight dollars and thirty-one cents ($88.31). This is based on the total amount of the College expenditures for this year, after deducting the amounts expended for experiment work and the amount expended for permanent improvements. It is as favorable a showing as can be made by any of the educational institutions of this or any of the States of this Union.

## EASTERN OREGON EXPERIMENT STATION.

Under the provisions of the Act of the Legislative Assembly of the State of Oregon, approved February 23, 1901, there was appropriated the sum of ten thousand dollars for carrying on, constructing, furnishing, and equipping buildings for agricultural experiments in Eastern Oregon, on a certain tract of land near the city of Union in the county of Union, Oregon. This land, consisting of six hundred and twenty acres, was by the provisions of said act, deeded by the State officers to the Board of Regents of the State Agricultural College, subject to a certain lease that will not expire until March 1, 1902. The committee appointed by the Board of Regents have secured possession of sixty acres of this land and have commenced the work thereon as contemplated by the act of the legislature. The money appropriated by this act is disbursed by the Secretary of

State as per vouchers endorsed as allowed by the committee of the Board of Regents. There has been expended out of this appropriation prior to July 1, 1901, the sum of $1,322.90. For the detailed statement of the items of this expenditure I would respectfully refer you to the itemized vouchers on file with the Secretary of State. Other and subsequent disbursements from this fund will be duly reported. This is a very valuable tract of land and is undoubtedly well adapted to the production of grasses. It would without doubt make a splendid stock farm. It is questionable as to whether it is the kind of land that is best adapted to the purpose of an experiment station, the object of which should be to determime the practicability and possibility of producing the forage plants suited and adapted to the large district of semi-arid lands of Eastern Oregon that have been devastated and rendered valueless by the destruction of the native grasses. It is to be earnestly hoped that this Station will result in great good to the people of the State. This is an important matter to the people of Eastern Oregon and to the people of all sections of this State. We should therefore strive to make this Experiment Station a success. It is to be hoped that it will prove to have been a wise move.

The following is a correct statement of all money on hand July 1, 1900, the amounts received on account of the several funds, the amounts disbursed therefrom and the balances on hand June 30, 1901:

EXPERIMENT STATION FUNDS.

| | | | |
|---|---|---|---|
| July 1, 1900—To balance on hand, Local Station | | $ 2,386.86 | |
| To amount from sales | | 657.16 | |
| | | $ 3,044.02 | |
| To amount from Hatch fund | | 15,000.00 | $18,044.02 |
| June 30, 1901—By amount expended, Local Station | | $ 2,247.90 | |
| By amount expended, Hatch Fund | | 15,000.00 | |
| By amount on hand, Local Station | | 796.12 | $18,044.02 |

AGRICULTURAL COLLEGE FUNDS.

| | | | |
|---|---|---|---|
| July 1, 1900—To amount on hand | | $ | |
| To amount received, Morrill, 1890 | | 25,000.00 | |
| To amount received, State Interest, 1862 | | 12,737.72 | $37,737.72 |
| June 30, 1901—By amount expended, Morrill | | $25,000.00 | |
| By amount expended, State Interest | | 12,691.39 | |
| By amount on hand, State Interest | | 46.33 | $37,737.72 |

SPECIAL STATE FUND—ACT OF 1889.

| | | | |
|---|---|---|---|
| July 1, 1900—To amount on hand | $ | 454.74 | |
| To amount transfer'd from heat. plant fund | | 458.96 | |
| To amount received from State | | 5,000.00 | $ 5,913.72 |
| June 30, 1901—By amount expended | $ | 4,697.61 | |
| By amount on hand | | 1,216.11 | $ 5,913.72 |

HEATING PLANT FUND.

| | | | |
|---|---|---|---|
| Sept. 30, 1900—To balance of State appropriation | $ | 458.98 | |
| By transfer to special fund | | 458.98 | |

IMPROVEMENT FUND.

| | | | |
|---|---|---|---|
| July 1, 1900—To amount on hand | $ | 115.29 | |
| To amount received from sales, etc. | | 643.92 | $ 759.21 |
| June 30, 1901—By amount expended | $ | 725.88 | |
| By amount on hand | | 33.33 | $ 759.21 |

CHEMICAL BREAKAGE FUND.

| | | | |
|---|---|---|---|
| July 1, 1900—To amount on hand | $ | 396.78 | |
| To amount received, fees | | 777.90 | $ 1,174.68 |
| June 30, 1901—By amount expended | $ | 509.96 | |
| By amount on hand | | 664.72 | $ 1,174.68 |

BALANCES ON HAND—ALL FUNDS.

| | | | |
|---|---|---|---|
| June 30, 1901—State Interest | $ | 46.33 | |
| Special | | 1,216.11 | |
| Improvement | | 33.33 | |
| Chemical Breakage | | 664.72 | |
| Local Station | | 796.12 | $ 2,756.61 |

I herewith submit a copy of the report of the Treasurer of the Board of Regents. From this report you will have detailed statement of the disbursements of all money for the year ending June 30, 1901.

There is also submitted a copy of the reports of the President of the College, Director and Vice-Director of the Station which will convey to you the progress and development in detail of the work of this College and Station during the year.

Under the provisions of the Act of the Legislative Assembly of the State of Oregon, approved February 6, 1901, ample and adequate means are provided and will be available to enable the Board of Regents to make all the required improvements recommended in the annual report submitted to you last year. This money, in my

judgment, will be ample and sufficient for years to come to meet all the necessary expense of the required new buildings, repairs, and other improvements, to accommodate not only the present number of students, but will be sufficient to make provision for a considerable increase in the number. This money, up to the date of this report, has not been received. Certain contracts have been entered into for some of the improvements contemplated being made and paid for out of the money appropriated by this act and the entire amount available will be necessary to meet the cost of the improvements now under contemplation.

It is hoped that by September, 1902, we may have completed an agricultural building adequate to accommodate the greater part of the Station staff. It is greatly needed so as to give the necessary room for the accommodation of the large number of students in the College department. Every indication is that this school will, during the next few years, have a large increase of scholars, making it necessary for the Board not only to provide more room but it will undoubtedly require additional help in some of the branches of the educational work.

Respectfully submitted,

J. T. APPERSON,

President of the Board of Regents.

# TREASURER'S REPORT.

*To the Honorable the Board of Regents, Oregon Agricultural College:*

GENTLEMEN:—Herewith I submit my report for the year ending June 30, 1901. The vouchers and other evidences of payment are on file in the office of the Clerk and Purchasing Agent.

Very respectfully,

B. F. IRVINE, Treasurer.

BALANCES OF HAND JULY 1, 1900.

| | | |
|---|---|---|
| Improvement Fund | $ 115.29 | |
| Chemical Breakage | 396.78 | |
| Local Station | 2,386.86 | |
| Special | 454.74 | |
| | | $ 3,353.67 |

INCOME FOR THE YEAR.

| | | |
|---|---|---|
| Station—Hatch | $15,000.00 | |
| College—Morrill | 25 000.00 | |
| State Interest | 12,737.72 | |
| Improvement | 643.92 | |
| Chemical Breakage | 777.90 | |
| Local Station | 657.16 | |
| Special | 5,000.00 | |
| Heating Plant | 458.98 | |
| | | $60,275.68 |
| Total available funds | | $63,629.35 |

DISBURSEMENTS.

| | | |
|---|---|---|
| Station | $15,000.00 | |
| College | 25,000.00 | |
| State Interest | 12,691.39 | |
| Improvement | 725.88 | |
| Chemical Breakage | 509.96 | |
| Local Station | 3,056.40 | |
| Special | 4,238.63 | |
| Heating Plant | 458.98 | |
| | $61,681.24 | |
| Less transfer from Local Station to Special on city sewer | 808.50 | |
| | | $60,872.74 |
| Balance on hand | | $ 2,756.61 |

BALANCES BY FUNDS.

| | | |
|---|---|---|
| State Interest | 46.33 | |
| Improvement | 33.33 | |
| Chemical Breakage | 664.72 | |
| Local Station | 796.12 | |
| Special | 1,216.11 | |
| | | $ 2,756.61 |

MISCELLANEOUS RECEIPTS AND THEIR DISTRIBUTION.

| SOURCE. | AMOUNT. | LOCAL STATION. | IMPROVEMENT. |
|---|---|---|---|
| Agriculture | $ 564.69 | $ 353.50 | $ 211.19 |
| Dairy | 431.30 | 269.65 | 161.65 |
| Horticulture | 47.00 | 29.25 | 17.75 |
| Miscellaneous | 258.09 | 4.76 | 253.33 |
| Totals | $1,301.08 | $ 657.16 | $ 643.92 |

## DISBURSEMENTS—SALARIES, INCIDENTALS, DEPARTMENTS.

| DEPARTMENT OR ITEM. | SALARIES. | INCIDENTALS. | TOTALS. |
|---|---|---|---|
| Printing | $ 1,600.00 | $ 681.79 | $ 2,281 79 |
| Agriculture | 4,010.00 | 2,707.67 | 6,717.79 |
| Horticulture | 1,781.65 | 1,318.71 | 3,100.36 |
| Botany | 1,500.00 | 540.15 | 2,040.15 |
| Chemistry | 4,300.00 | 1,271.22 | 2,571.22 |
| Chemical Breakage | | 509.96 | 509.96 |
| Bacteriology | 1,200.00 | 137.52 | 1,337.52 |
| Entomology | 2,100.00 | 740.15 | 2,840.15 |
| Mechanics | 3,840.00 | 871.58 | 4,711.58 |
| Household Economy | 1,860.00 | 56.93 | 1,916.93 |
| Military | 200.00 | 82.70 | 282.70 |
| Library | 360.00 | 393.74 | 753.74 |
| Drawing | 475.00 | 28.39 | 503.39 |
| Salaries outside departments | 16,999.00 | | 16,999.00 |
| Sanitary | 233.00 | 19.00 | 252.00 |
| Furniture | | 67.60 | 67.60 |
| Traveling expenses | | 1,196.55 | 1,196.55 |
| Advertising | | 136.20 | 136.20 |
| Fuel | | 613.25 | 613.25 |
| Insurance | | 354.82 | 354 82 |
| Postage | | 323.99 | 323.99 |
| Freight | | 448.05 | 448.05 |
| Telephones and telegrams | | 109.47 | 109.47 |
| Scientific apparatus | | 280.94 | 280.94 |
| Tools and machinery | | 324.64 | 324.64 |
| Building repairs—general | | 444.51 | 444.51 |
| Building repairs—Station | | 31.12 | 31.12 |
| Building, new, Station | | 207.90 | 207.90 |
| Miscellaneous labor | | 662.77 | 662.77 |
| Miscellaneous supplies | | 400.43 | 400.43 |
| Miscellaneous salaries | | 533.30 | 533.30 |
| Girls' hall | | 92.67 | 92.67 |
| Boys' hall | | 604.93 | 604.93 |
| Sewer—city | | 1,916.54 | 1,916.54 |
| Miscellaneous and current | | 606.45 | 606.45 |
| Administration building repairs | | 164.28 | 164.28 |
| Walk—main | | 975.70 | 975.70 |
| Gymnasium | | 558.47 | 558.47 |
| Totals | $40,458.65 | $20,414.09 | $60,872.74 |

## TREASURER'S ACCOUNT—FACE OF LEDGER.

| FUND. | DR. | CR. | BALANCES. |
|---|---|---|---|
| Station | $15,000.00 | $15,000.00 | $ |
| College | 25,000.00 | 25,000.00 | |
| State Interest | 12,737.72 | 12,691.39 | 46.33 |
| Improvement | 759.21 | 725.88 | 33.33 |
| Chemical Breakage | 1,174.68 | 509.96 | 664.72 |
| Local Station | 3,852.52 | 3,056.40 | 796.12 |
| Special | 5,913.72 | 4,697.61 | 1,216.11 |
| Heating Plant | 458.98 | 458.98 | |
| Totals | $64,896.83 | $62,140.22 | $ 2,756.61 |
| Less transfers | | 1,267.48 | |
| Actual expenditures | | $60,872.74 | |

# REPORT OF THE FINANCE COMMITTEE.

CORVALLIS, OREGON, July 17, 1901.

*To the Board of Regents:*

GENTLEMEN:—We your Finance Committee, would respectfully report that we have examined the books and vouchers in the office of the Clerk and Purchasing Agent and find the same well kept, neat and correct. We have checked up all the drafts and compared them with the vouchers on file and find the same to be as set forth in the accounts kept by the clerk. We have examined the pay roll of the teachers and employes of the College and find the same to be in accordance with the order of the Board.

We have examined the report of the treasurer for the past year and find the same correct. We find it to agree with the books and vouchers on file in the office of the Clerk and Purchasing Agent.

## FINANCIAL STATEMENT.

| | | |
|---|---|---|
| Balance on hand in the different funds June 30, 1901 | | $ 2,756.31 |

### ESTIMATED INCOME.

| | | |
|---|---|---|
| Hatch Fund | $15,000.00 | |
| Morrill Fund | 25,000.00 | |
| State Interest—probable | 10,000.00 | |
| Special from State | 5,000.00 | |
| From farm sales | 1,000.00 | |
| From chemical fees | 500.00 | |
| | | $56,500.00 |
| Total probable income | | $59,256.31 |
| The disbursements last year were in the aggregate | | $60,872.74 |
| Deducting for certain extraordinary expenses—Sewer | $ 1,916.54 | |
| Walk | 975.70 | |
| Cauthorn Hall | 500.00 | |
| Total | $ 3,392.24 | |
| Leaves the probable expenditures for the coming year on the basis of last year's expenditures | | $57,480.50 |
| This will leave a working margin of | | 1,775.80 |

On the basis of last year's expenditures by departments, as set forth in the treasurer's report, we recommend the following distribution of the expenditures:

| | |
|---|---|
| Printing | $ 2,281.79 |
| Agriculture | 6,717.67 |
| Horticulture | 3,100.36 |
| Botany | 2,040.15 |
| Chemistry | 5,571.22 |
| Chemical breakage | 509.96 |
| Bacteriology | 1,337.52 |
| Entomology | 2,840.15 |
| Mechanics | 4,711.58 |
| Household economy | 1,916.93 |
| Military | 282.70 |
| Library | 753.74 |
| Drawing | 503.39 |
| Salaries, outside of departments | 16,999.00 |
| Sanitary | 252.00 |
| Furniture | 67.60 |
| Traveling expenses | 1,196.55 |
| Advertising | 136.20 |
| Fuel | 613.25 |
| Insurance | 354.82 |
| Postage | 323.99 |
| Freight | 448.05 |
| Telephones and telegrams | 109.47 |
| Scientific apparatus | 280.94 |
| Tools and machinery | 324.64 |
| Building repairs—general | 444.51 |
| Building repairs—Station | 31.12 |
| Building, new, Station | 267.90 |
| Miscellaneous labor | 662.77 |
| Miscellaneous supplies | 400.43 |
| Miscellaneous salaries | 533.30 |
| Girls' hall | 92.67 |
| Boys' hall | 104.93 |
| Miscellaneous and current | 606.45 |
| Administration building repairs | 164.28 |
| Gymnasium | 558.47 |
| Total | $56,480.50 |

Respectfully submitted,

Finance Committee { J. M. CHURCH,
B. G. LEEDY,
BENTON KILLIN.

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## FINANCE COMMITTEE REPORT.

SUPPLEMENTARY.

CORVALLIS, OREGON, July, 17, 1901.

*To the Board of Regents:*

GENTLEMEN:—Whereas, in the financial report of the undersigned committee, made July 18, 1900, by some oversight of the committee, a report of the Treasurer's statement does not appear on the minutes of the annual meeting on said day. We therefore report at this time that we examined said statement and found it correct.

Respectfully submitted,

J. M. CHURCH,
BENTON KILLIN,
B. G. LEEDY,
Finance Committee.

# REPORT OF THE PRESIDENT.

*To the Honorable Board of Regents of the Oregon Agricultural College:*

GENTLEMEN:—I beg leave to submit my report for the college year ending June 12, 1901.

## ATTENDANCE.

The enrollment was the largest in the history of the College, viz., 436, exclusive of the Farmers' Short Course. For a statement in detail of the number in each class and for other information pertaining to attendance, I refer you to our last annual catalogue.

## COLLEGE AND STATION.

The work of the College and the work of the Station should be segregated and kept separate as far as practicable. The routine of recitations and lectures is a serious interruption to original research and experimentation; on the other hand, the frequent absences from the lecture room of professors who are connected with both College and Station is utterly demoralizing to classes. Besides, it sometimes happens that a professor connected with both departments makes his College work an excuse for not prosecuting with greater engergy certain lines of investigation in experimental work, when, perhaps, the College can with better reason complain of his neglect of classes. If these conditions were unavoidable I would look upon the union of Station and College as an unhallowed kind of wedlock. But the objections can to a great extent be obviated. If left to my judgment the head chemist, the entomologist and the bacteriologist will limit their work to the Station, while the botanist, the assistant professor of chemistry and the instructor in biology will do only such station work as college duties will permit.

## DEPARTMENT OF MUSIC.

We ought to have a good teacher of vocal and instrumental music. Many of our students are from the country and if they do not have an opportunity to learn music here they will remain forever ignorant of this elevating study. We are the only prominent school in the Northwest in which the systematic study of music is neglected. The Hoag place can be had at a low rental, and at a small outlay

can be made comfortable. It would make an excellent music hall, and would, as an annex to Alpha Hall, accommodate several boarders. A lady teacher could be had for about $600.00 a year, half of which could probably be raised by charging a moderate fee for tuition.

PHYSICAL DIRECTOR.

The President of the Board acted with me in securing a Physical Director. After an extended correspondence with various teachers we settled upon J. B. Patterson of the University of Wooster as the most eligible. He accepted an offer of $75.00 a month till July, 1901, with the understanding that if he gave satisfaction he would very likely be continued. The selection has proved very fortunate. Our Department of Physical Culture has greatly prospered both with respect to gymnasium work and out-door athletics.

INTERCOLLEGIATE ATHLETICS.

The following letter was addressed to the Presidents of the State University, Willamette University, Pacific University, Pacific College, McMinnville College, Albany College, State Normal School at Monmouth, College of Philomath, and Philomath College:

MY DEAR SIR:—The Regents of the Oregon Agricultural College have requested me to confer with the Presidents of our prominent institutions of learning respecting athletics.

You would greatly oblige by informing me if you would approve rules similar in essential points to those enclosed taken from "Regulations on Athletics" adopted by Harvard University.

You would confer a favor, too, by letting me know if it would accord with your wishes that we attempt by concerted action to free our intercollegiate athletics from professionalism and other objectionable features.

Very sincerely yours,

THOS. M. GATCH,

President of the Oregon Agricultural College.

RULES ENCLOSED IN FOREGOING LETTER.

RULES OF ELIGIBILITY.

RULE 1. No one shall be allowed to represent Harvard University in any public athletic contest, either individually or as a member of any team, unless he can satisfy the Committee on the Regulation of Athletic Sports that he is, and intends to be throughout the College year, a *bona fide* member of the University, taking a full year's work.

* * * * * * * *

RULE 4. No one who is not a regular student in the College or Scientific School, and *no regular student in either of these departments who has ever played in any intercollegiate contest upon a class or university team of any other college, shall play upon a Harvard team until he has resided one academic year at the University and passed the annual examinations upon a full year's work.*

RULE 5. No student shall be allowed to represent Harvard University in any public athletic contest, either individually or as a member of any team, who, either before or since entering the University, shall have engaged for money in any athletic competition, whether for a stake, or a money prize, or a share of the entrance fees or admission money; or who shall have taught or engaged in any athletic exercise or sport as a means of livelihood; or who shall at any time have received for taking part in any athletic sport or contest any pecuniary gain or emolument whatever, direct or indirect, with the single exception that he may have received from the College organization, or from any permanent amateur association of which he was at the time a member, the amount by which the expenses necessarily incurred by him in representing his organization in athletic contests exceeded his ordinary expenses.

The answers received from the various Presidents accompany this report.

THE COMMANDANT.

Having conferred with the President of the Board of Regents, I addressed on May 8, 1901, the following letter to Dr. Henry H. Goodell, Chairman of the Executive Committee of the American Association of Agricultural Colleges:

DEAR SIR:—We have had no regular army commandant since the spring of 1899 when Lieutenant Woodbridge Geary was ordered to Porto Rico. We hightly appreciate the interest you have taken in the welfare of our College and would trespass further on your kindness by asking your aid in securing for us an officer in active service. We do not wish a retired officer. When Lieutenant Geary was taken from us we were given to understand that he would be returned when the war closed but he was killed in battle near Manila.

Very truly yours,

THOS. M. GATCH,

President Oregon Agricultural College.

A letter of similar import was addressed to the Secretary of War and a direct application was made for the detail of a regular army officer to act as our Commandant. The accompanying answers show that there is no probability of our securing an officer in active service.

I respectfully ask that the present incumbent be continued. He has been eminently successful as Commandant of the Cadets. He has voluntarily undertaken work not required by the War Department. If he confine himself to required work his duties as Commandant will not seriously interfere with his work in chemistry.

GRADUATES.

June 12, 1901, on the recommendation of the Faculty, the President of the Board presented each of the following with a diploma certifying to his attainments, and the president of the College conferred on each the degree of Bachelor of Science:

HOUSEHOLD SCIENCE COURSE.

*Title of Thesis.*

Ivy Grace Burton, Flora Wilson, ---- Fermentation.
Henrietta Campbell ---- Progress of Civilization in America During the Last Six decades.
Carrie Agnes Danneman ---- Our present Mode of Living Tends to Degeneracy.
Myrtle Vine Herbert, Grace Michael, ---- Propagation of Tropical Plants.
Maud Hoover, Bessie Lea Michael, ---- Yeast.
Mabel Lenore Jones, Mabel Withycombe, ---- Rose Culture.
Ethel B. Kyle ---- Culture and Propagation of Chrysanthemums.
Blanche Eglantine Riddle ---- The Crusades as a Factor in Civilization.
Besse Gertrude Smith, Lizzie Hoover, ---- Cultivation of the Begonia Gloxinia and Carnation.

AGRICULTURAL COURSE.

*Title of Thesis.*

Ivan Corlas Brown, Robert Withycombe, ---- A Study and Comparison of Hays and Fodders grown on Lowlands and Uplands.
Charles Herbert Horner ---- Blackleg.
William Sumner Junkin ---- Preparation of Commercial Fertilizers.
Fred Newton Stump ---- Some Oregon Plant Lice.

MECHANICAL COURSE.

*Title of Thesis.*

Alfred Campbell, Stanley Darle Herbert, ---- Mechanical Properties of Willamette Valley Brick.
William Bennett Hillman, John Thomas Wiley, ---- Incandescent Lamps.
William L. Pate ---- Efficiency Test of Power Plant at Oregon Agricultural College.
Leo J. Kraps, Edgar Raymond Shepard, ---- Efficiency Test of Electric Motor.

COURSE IN PHARMACY.

*Title of Thesis.*

Cora Mabel Davis, Esther Blanche Holden, ---- Determination of the Constituents of Scoparius.
Fred LeRoy Colvig, Ernest Winfield Redd, ---- Alkaloidal Assay of Berberis Aqui folium, "Oregon Grape."
John Louis Stalker, Marcus Clyde Williams, ---- Separation and Identification of the Principal Alkaloids of Cinchona succirubra.

The degree of Master of Science was conferred on each of the following:

*Title of Thesis.*

John F. Fulton, Class '92 ---- On the Value of Cheat as a Forage Plant.
Clarence Melville McKellips, Purdue University, '99 ---- Granular Effervescent Salts.
Doctor Willard W. Smith, Class '95 ---- Suggestions Relating to a Rotary Valve.
Arthur Roy Woodcock, Class '99 ---- Annotated List of the Birds of Oregon.

If it please the Board it would be desirable to have this action noted in the minutes as approved.

INVENTORIES.

Pursuant to resolution of the Board inventories of the property belonging to different departments and the Halls, have been taken. These can be seen in the clerk's office.

Accompanying will be found a list of salaries paid instructors and wages paid other employees; also, a copy of my report to the Secretary of the Interior and the Secretary of Agriculture, as required by act of Congress of August 30, 1890.

Respectfully submitted,

THOS. M. GATCH, President.

# STATE AGRICULTURAL COLLEGE OF OREGON,

CORVALLIS, Oregon, June 30, 1901.

*Report of the President of said institution to the Secretary of the Interior and the Secretary of Agriculture, as required by act of Congress of August 30, 1890, in aid of Colleges of Agriculture and Mechanic Arts.*

## I. Condition and Progress of the Institution for the year ended June 30, 1901, especially—

(1) Changes in course or methods of instruction if of sufficient importance to warrant mention, and (2) purpose, structural character, and cost of new buildings or addition to buildings.

1. A two years' Business course has been authorized for 1901–1902, et seq.

## II. Value of Additions to Equipment during the year ended June 30, 1901.

| | |
|---|---|
| (a) Permanent endowment | $ |
| (b) Buildings | 207.90 |
| (c) Library | 393.74 |
| (d) Apparatus | 280.94 |
| (e) Machinery | 324.64 |
| (f) Miscellaneous | 558.47 |
| Total | $1,765.69 |

## III. Farmers' Institutes during the year ended June 30, 1901.

| | |
|---|---|
| 1. Number of institutes held in the State | 11 |
| 2 Total attendance | 3,100 |
| 3. Number of institutes attended by college and station staffs | 11 |
| 4. Number of different members of the staffs engaged in the work | 4 |
| 5. Amount of time in days given to institute work by college and station staffs | 113 |
| 6. State appropriation for institutes for year ended June 30, 1901 | None |

In addition to Farmers' Institutes, members of the Station staff have taken part in 14 Stock Breeders' Conventions, Dairymens' and Farmers' meetings.

## IV. Student Labor during the year ended June 30, 1901.

1. Does your institution employ student labor? To a limited extent.
2. Number of students employed during year. Cannot give.
3. Average amount earned by each student. Cannot give.
4. Total amount expended for student labor. $805.30.
5. Amount of State appropriation for student labor, none

We pay 10 cents an hour during term time and 12½ cents during summer vacation.

## V. Receipts for and during the year ended June 30, 1901.

| | | |
|---|---|---|
| 1. Balance on hand July 1, 1900, over and above all indebtedness (excluding funded debt, if any) | | $ 3,353.67 |
| 2. State aid. | (a) Income from endowment granted by State | |
| | (b) Appropriation for current expenses | 5,000.00 |
| | (c) Appropriation for building or for other special purposes | 458.98 |
| 3. Federal aid. | (a) Income from land grant, act of July 2, 1862 | 12,737.72 |
| | (b) Income from other land grants | |
| | (c) Additional endowment, act of August 30, 1890 | 25,000.00 |
| | (b) For experiment station, act of March 2, 1887 | 15,000.00 |
| 4. Income from endowment other than Federal or State grants | | |
| 5. Fees and all other sources. | (a) Tuition fees | |
| | (b) Incidental fees | 777.90 |
| | (c) Miscellaneous receipts | 1,301.08 |
| Total | | $63,629.35 |

## VI. Expenditures for and during the year ended June 30, 1901.

| | |
|---|---|
| 1. Instruction (including facilities) in the subjects specified in act of Augut 30, 1890 | $25,000 00 |
| 2. Instruction in all other subjects, if any, not mentioned in question 1 of this series | |
| 3. Administrative expenses (salary of president, secretary, treasurer, etc.; clerical service, fuel, light, etc.) | 16,290.93 |
| 4. For buildings and repairs | 1,525.41 |
| 5. Experiment station | 18,056.40 |
| Total | $60,872.74 |

## VII. Property, year ended June 30, 1901.

Value of all buildings, $94,000; of apparatus, $3,000; of machinery, $16,000; of library, $------; of other equipment, $------.

Value of above property not used for instruction in the subjects specified in section 1 of act of August 30, 1890: Buildings, $49,000: of other equipment, $3,000.

Total number of acres in farm and grounds, 198.91; acres under cultivation, 125; acres used for experiments, 75; value of farm and grounds, $15,000.

Number of acres of land allotted to State under act of July 2, 1862, 90,000; acres still unsold, ------; value of unsold land, $------.

Amount of land-grant fund of July 2, 1862, $131,556.37; amount of other land-grant funds, $------; amount of other permanent funds, $------.

Number of bound volumes in library, June 30, 1901, 3,100; pamphlets, unknown.

## VIII. Professors and Instructors during the year ended June 30, 1901.

| 1. College of Agriculture and Mechanic Arts: | MALES. | FEMALES. |
|---|---|---|
| (a) Preparatory classes | -- | -- |
| (b) Collegiate and special classes | 23 | 5 |
| (c) Total, counting none twice | 23 | 5 |

2. Number of other departments, none.
3. Number of staff of experiment station, 10.

## IX. Students during the year ended June 30, 1901.

| 1. College of Agriculture and Mechanic Arts: | MALES. | FEMALES. |
|---|---|---|
| (a) Preparatory classes | --- | --- |
| (b) Collegiate classes | 281 | 146 |
| (c) Post graduate courses | 4 | 5 |
| (d) Short or special courses | --- | --- |
| Total, counting none twice | 285 | 151 |

2. Number in all other departments, none.
3. Number of students that pursued courses in agriculture, 61; mechanical engineering, 92; civil engineering, none; electrical engineering, 19; mining engineering, 6; chemical engineering, none; textile industry, none; architecture, none; household science, 103; veterinary science, 6; dairying, all in agriculture; military tactics, 285.
4. How many students graduated during year ended June 30, 1901? Men, 18; women, 16.
5. Average age of students graduated during year ended June 30, 1901, 21 years 1 mo. 4 days.
6. What degrees and how many of each kind were conferred in 1900–1901?
   On men, B. S. on 18.
   On women, B. S. on 16.
7. What and how many honorary degrees were conferred in 1900–1901? M. S. on 4 men.

(Signed:) THOS. M. GATCH, President.

(Date:) June 30, 1901.

# REPORT OF THE DIRECTOR.

*To the Honorable Board of Regents of the Oregon Agricultural College and Experiment Station:*

GENTLEMEN:—I beg leave to transmit herewith the report of the Vice-Director, to whose management the success of the Station is chiefly due.

Dr. E. W. Allen, Assistant Director of Experiment Stations, lately visited us, and made a thorough investigation of our affairs. It may not be amiss for me to say that in private conversation he assured me that since his first acquaintance with our Station, dating several years back, its work had never been so satisfactory as during the past year.

Accompanying find statement of account.

Respectfully,

THOS. M. GATCH, Director.

## FINANCIAL ACCOUNT.

Oregon Agricultural Experiment Station, in account with the United States Appropriation, 1900–1901.

DR.

| | |
|---|---|
| To receipts from the Treasurer of the United States as per appropriation for fiscal year ending June 30, 1901, as per act of Congress approved March 2, 1887 | $15,000.00 |

CR

| | | |
|---|---|---|
| By Salaries | $ 9,031.00 | |
| Labor | 2,055.18 | |
| Publications | 212.92 | |
| Postage and stationery | 71.32 | |
| Freight and express | 203.89 | |
| Heat, light, water, and power | 724.36 | |
| Chemical supplies | 1,139.69 | |
| Seeds, plants, and sundry supplies | 37 50 | |
| Fertilizers | 293.95 | |
| Feeding stuffs | 194.89 | |
| Library | 244 59 | |
| Tools, implements, and machinery | 13.65 | |
| Furniture and fixtures | 212.08 | |
| Scientific apparatus | 251.85 | |
| Live stock | 74.96 | |
| Traveling expenses | 238.17 | |
| Contingent expenses | | |
| Buildings and repairs | | $15,000.00 |

## SUPPLEMENTARY REPORT.

LOCAL STATION FUND.

| | | |
|---|---|---|
| Balance on hand July 1, 1900 | $ 2,386.86 | |
| Received from sales of farm products, etc. | 657.16 | |
| | | $ 3,044.02 |

DISBURSEMENTS.

| | | |
|---|---|---|
| Labor | $ 355.00 | |
| Freight and express | 37.00 | |
| Seeds, plants, and sundry supplies | 118.65 | |
| Live stock | 176.60 | |
| Traveling expenses | 481.00 | |
| Contingent expenses | 79.65 | |
| Sewerage | 1,000.00 | |
| Balance | 796.12 | |
| | | $ 3,044.02 |

# REPORT OF THE VICE-DIRECTOR.

*Director Thomas M. Gatch, Oregon Experiment Station:*

DEAR SIR:—I have the pleasure to present herewith the report of the agricultural division, together with the reports of the Station Chemist, Entomologist, Horticulturist, Bacteriologist, and Floriculturist for the year ending June 30, 1901.

## AGRICULTURAL DIVISION.

The work of this department on the farm during the past year, has largely consisted of experiments with leguminous crops. The increased interest taken by our farmers in the rotation system of farming, especially that of alternating cereal crops with clover, is indeed gratifying. The Station Staff feels encouraged to undertake further experiments for the determination of the value of these rotation crops, both as economic stock foods and as soil renovators.

## CO-OPERATIVE WORK.

This Station during the past year has undertaken two lines of co-operative work with the Department of Agriculture, Washington, D. C., namely, the experimental growing of sand-binding grasses at Gearhart Park and field tests with sixteen samples of red clover seed, collected in different States and countries.

It was also contemplated to experiment with sand-binding grasses for reclaiming the sand-dunes of the upper Columbia, but regret that unforseen circumstances interfered with the work for this season. Since this work of reclaiming the drifting sands on the upper and lower Columbia is of considerable economic value to the agricultural interests of the State, it should be prosecuted as vigorously as the finances of the Station will permit. Thus far the work at Gearhart Park with sand-binding grasses promises to give good results. A quantity of rape seed and smaller amounts of clover and vetch seed have been distributed among the farmers of the State during the past year for co-operative work in testing their adaptability for certain soils, and also to encourage the more general growing of these crops.

The Department of Agriculture, Washington, D. C., has kindly supplied the Station with a number of new varieties ef foreign cereals and also furnished seed of leguminous and other forage plants, both foreign and domestic, for tests. These are being grown under various cultural methods to determine their value and adaptability to conditions here.

A joint effort with the division of botany is being made to secure seeds from native forage plants, of which we have many varieties that give promise of economic value. There seems to be no apparent necessity for the expenditure of much energy in securing new varieties of leguminous forage plants for western Oregon, as the clovers, vetch, and pea do remarkably well in this section. But in eastern Oregon this question assumes an entirely different phase. Aside from growing alfalfa under methods of irrigation, and the growing of the field pea, no leguminous forage plant has yet proven its adaptability to the great wheat growing section in the eastern portion of this State. Hence this section presents an exceedingly broad and important field for work with forage plants.

The urgency of this work is not recognized by the farmers at the present, who honestly though mistakenly believe that, with the recuperative influences of the summer fallow, wheat growing can continue indefinitely. These volcanic soils are phenomenally productive at present and wheat can be grown with an almost incredibly small amount of precipitated moisture. However, from the lessons taught other agricultural communities by long experience the inference is drawn that a continuance of the present popular system of summer fallowing will inevitably sooner or later reduce the humus content of the soil so low as to seriously jeopardize its moisture-bearing capabilities. The growing of humus forming forage crops, in rotation with the cereals, apparently offers the only solution for the perpetuation of wheat growing in these sections.

Although clover and vetch give promise of becoming the standard leguminous crops for western Oregon, there is however a field of usefulness for alfalfa. The heavy clay soils of the Willamette valley have been considered in the past to be wholly unsuited to the growing of alfalfa. This impression is not substantiated by the experience of the Station, for an experimental plat of alfalfa which has been growing for six years on heavy clay soil, pro-

duced at the first cutting, May 15th of this season, at the rate of 22.83 tons of green feed per acre. The second cutting, July 1st, yielded at the rate of 14.32 tons per acre; thus making a total of 37.15 tons of green feed per acre for the two cuttings.

## ANIMAL HUSBANDRY.

The transition from exclusive grain growing to systems of mixed husbandry, creates an interest on the part of the agriculturist in methods of handling and feeding the domestic live stock. Hence the scope of this work at the Station during the past year was somewhat enlarged, and embraced the experimental feeding of dairy cows, beef cattle, sheep, and swine.

The results of the experiment of feeding steers were not satisfactory, owing to the continued wildness of the animals and their failure to become reconciled to confinement. For this reason they could not be induced to eat sufficient food to give profitable returns. This points to the importance of an effort on the part of farmers to maintain a more highly domesticated condition of the live stock of the farm.

Experiments in sheep feeding under sheltered and unsheltered conditions were undertaken. For this work 12 fall shorn wether lambs were selected, which were as uniform both in size and breeding as could be obtained. These were carefully divided into two lots. Six of these lambs were placed in a clean enclosure without shelter, and the other six were sheltered in a comfortable, clean, well ventilated and well lighted pen. The rations of the two lots were the same, and they ate practically an equal quantity, except the waste was slightly greater with the unsheltered Lot 1.

At the end of the feeding period Lot 1 had gained 155 lbs.; Lot 2, 149 lbs. They were then shorn and Lot 1 produced 21 lbs. of unwashed wool; Lot 2, 27.75 lbs. Ten pounds of the wool from each lot were carefully tub-washed and dried, with the result that the sample taken from Lot 1, after this treatment weighed 7.75 lbs.; Lot 2, 8 lbs. This showed that while Lot 1 made the larger gain in live weight, Lot two made the more profitable gain, when the value of the wool is taken into account.

Experiments conducted with swine feeding were:

A. Pasturing clover and rape to determine their possible value as hog food.

B. Feeding silage as compared with boiled clover hay.

C. Cooked as against uncooked grain for fattening swine.

The results of this work in brief are as follows:

First. It was found that 12 pigs having access from May 2 to August 2, to .16 acre of clover with 317 lbs, of shorts and 1276 lbs. of milk, made a gain of 253 lbs. in live weight. Also that 10 pigs pastured on one acre of June sown rape, without a grain ration, from August 20 to October 1, 1900, inclusive, made a gain of 154 lbs. live weight.

Second. Six pigs of the same litter were divided into two lots. Lot 1 was fed boiled clover hay, and consumed of this during the period of 122 days' feeding, 619 lbs., representing 551 lbs. dry substance. In addition, the pigs of this lot received 488 pounds of equal parts of wheat and barley chop.

Lot 2 was fed 2,032 lbs. of clover silage, representing 488 lbs. of dry substance, with 488 lbs of the ground wheat and barley. Lot 1 gained 154.50 lbs. in live weight; Lot 2, 128 lbs.

Third. These pigs were put together and redivided as evenly as practicable, into two lots. Lot 1 was fed wheat, and barley chop cooked; while Lot 2 was fed the same kind and quantity of feed, dry. Each lot consumed 1,834 lbs. of chop and 1,800 lbs. of milk. The period of feeding lasted from January 2 to April 2, 1901, inclusive; with the result that Lot 1 gained in live weight 428 lbs; Lot 2, 470 lbs.

Investigations of animal parasites have been undertaken together with the department of entomology. From data already at hand, it is evident that the liver fluke (*Fasciola hepatica*), is widely distributed throughout the western and Southern portions of the State.

The parasite is found in cattle, sheep, and goats. Many losses of farm stock are attributed to this parasite, when in fact they are due to dietetic ailments. The following case which occurred at the Station, will serve as an illustration. Seven sheep from a large flock reputed to have nearly all succumbed to the ravages of the liver fluke, were secured for the Station. All of these sheep were greatly emaciated, and two of them died shortly after their arrival A careful post mortem examination of these two, and one other killed for the purpose, revealed but few flukes in the gall ducts. One harbored a small tapeworm, also a few stomach worms, *Strongylus contortus*. The other was practically free from parasitic infection. The remaining four were given 4 drams of gasoline with 10 drops of carbolic acid, in 4 ounces of milk, once daily for three

days. They were then turned on a piece of rape, with the result of an aggregate gain in live weight of 88 pounds in 40 days. Infection from tapeworm is quite general among sheep and goats throughout the State. The stomach worm, unfortunately, is also getting a good foothold. The direct losses by death from these parasites are not large; but unquestionably there are great financial losses incurred from the persistent unthriftiness of the infected animals.

### MISCELLANEOUS WORK.

The experimental work in growing leguminous crops in rotation with grain at Moro, Sherman county, is continued. During the growing season weekly moisture determinations are made of the soil of each plat at the chemical department. So far the field pea is the only leguminous crop which has given satisfactory results. The vetches, both *Vicia Sativa* and *Vicia Villosa*, have failed to grow.

Negative results were obtained from experiments conducted last season with sodium nitrate on cereals. No appreciable increase in yield was secured as a result of its application.

The blasting of land with dynamite as a possible substitute for subsoil plowing does not so far promise sufficient returns in the form of increased value of crop to warrant the expense.

Experiments with the use of disintegrated granite as a possible potash supply have been undertaken this season. Three analyses of this granite made at the chemical department, give an average potash content of 3.83 per cent. The purpose of the work is to determine if this sand possesses any value as a source of available potash and as an agent for improving the mechanical condition of the heavy clay soils, both in fruit growing and general farming.

A comprehensive work with several rotation systems of cropping has been undertaken to determine their practicability for the general farmer, as well as their ultimate effect upon the physical and chemical condition of the soil.

The work on silage will be continued and in addition to the four stave silos erected last year, five smaller ones are in the course of construction for more technical work.

A study of methods of handling clover for the silo constituted the major portion of the work the past season. Thus far, results indicate that clover can be successfully ensiled, and is in the best condition for the silo when at the proper stage for hay.

Immaturity of the plant and excessive compactness of the silage seem to favor the formation of organic acids. Also that acidity and loss of dry substance seem to exist in a comparatively fixed proportion. This will be noted in the analysis of the immature corn silage, and the analyses made from the composite samples of all the partial samples taken from each silo, given in Bulletin 67 of this Station.

FARMERS' INSTITUTES.

During the past year eleven farmers' institutes have been held under the auspices of the Station, with an aggregate attendance of 3,100 persons.

It is gratifying to note the increased interest taken in these institutes, and the very general and prompt applications of methods suggested by the Station staff to the practices of the farm.

In addition to the institute work, members of the staff have attended during the past year and taken part in fifteen other agricultural meetings, comprising stock breeders' conventions, dairymens' and farmers' gatherings.

The agricultural department has prepared two bulletins during the past year on the following topics: "Creameries and Cheese Factories in Western Oregon," "The Silo and Silage."

Receipts from sales of stock, farm and dairy products during the year, $996.99.

ACKNOWLEDGEMENTS.

The Station takes this opportunity to express its keen appreciation for assistance rendered in the matter of transportation by Mr. C. H. Markham of the Southern Pacific; also the Oregon Railway and Navigation Company through the kindness of Mr. R. C. Judson, thus permitting us to enlarge the scope of our field work at the minimum expense to the Station.

Very respectfully submitted,

JAMES WITHYCOMBE.

## REPORT OF THE DAIRY INSTRUCTOR.

Besdes the regular course of instruction in butter and cheese making with regular and short course students, the dairy department has conducted four experiments as follows:

First. A study of the two prevailing methods of securing cows in the barn, namely, confined in the stalls or confined in rigid stanchions. Four cows were divided into two lots of two each, making the average period of lactation and milk yield as nearly equal for the two lots as possible. Careful records of the yield of milk and butter fat were kept for three months, the results showing a decided gain in favor of keeping the cows in stalls rather than in stanchions.

Second. A study of the effect of passing milk through the centrifugal separator with reference to improving its keeping qualities, and the removal of impurities. A series of eight trials in connection with the department of bacteriology failed to show any very marked gain, either in purification or keeping qualities. The effect of Pasteurization was also studied in this connection, showing a very marked gain in both keeping quality and purity, and no injury to flavor. The pasturization, however, caused the cream to rise but slightly on the milk, when allowed to stand for several hours.

Third. Daily records of milk yield and weekly composite tests of butter fat were made of each cow in the Station herd, during the month of June, to determine the cost of producing milk and butter fat under the soiling system.

Fourth. Work at the Corvallis creamery, consisting of a comparison of results of testing each patron's milk daily, as against the making of the composite test, covering a period of two weeks. The results showed the composite test to be wholly satisfactory if properly handled. The method of taking the sample was also studied, there being practically no difference between the samples taken with Scoville sampling tube and the more common method of using a small dipper holding a half ounce or thereabouts.

Throughout the year a record of the Station herd has been kept showing the daily milk yield and average monthly test per cow.

Official test was made of a registered Guernsey cow owned by R. G. VanValjah of Springfield, Oregon. This test was made at the home of the owner of the cow and required four days' time.

The dairy instructor has been in attendance at all the farmers' institutes, held by the Station during the past year, and has filled a regular place on the program of each meeting besides operating the stereopticon at the evening sessions.

During the coming year the dairy department will make a thorough study of the question arising in connection with the testing of cream, using the Babcock method and scales for weighing the cream. Work on the composition of Oregon butter and cheese will also be taken up in connection with the chemical department. There will also be some line of investigation carried on with the College herd of cows.

Very respectfully submitted,

F. L. KENT.

# REPORT OF THE CHEMIST.

*Dr. James Withycombe, Vice-Director:*

I beg to submit the following outline of the annual report of the Chemical Department for the year ending June 30, 1901.

The work of the year has been somewhat varied and a brief synopsis or outline of the work will be given in this report.

## SILOS AND SILAGE.

In connection with the Agricultural Division, we have spent considerable time in studying silage and the changes which take place in the silo. Samples were taken of the materials when put into the silos and also when taken out and careful analyses have been made of all these samples. The analyses included both the complete fodder analysis and also the determination of the acidity of the samples. Various methods were used in filling the silos, the object being to find out, if possible, the best means of preserving silage in this region. This Division is at present experimenting with silage packed in two quart Mason jars.

## ACID SOILS.

Acid soils are quite prevalent in some parts of this State and in order to determine to what extent they exist a circular bulletin was issued and sent to several hundred farmers in the State. This circular described acid soils and gave directions for testing the soil for acidity. Each circular was accompanied with a liberal supply of blue litmus paper to be used in making the tests. This litmus paper, after having been used in making the tests, was returned to the Experiment Station accompanied by a detailed description of the tested soil.

Thus far 169 reports have been received and of this number 86 gave indications of much acid in the soil; 65 gave indications of only small amounts of acid while 18 indicated no acidity in soil.

It is important to know whether Oregon soils are generally acid or not, because acid in the soil has a very great influence upon its productiveness. In some States certain crops have been complete failures, and this has been traced to an excessive acid condition of the soils. When this acid condition of the soil was corrected the

fields again produced abundant crops. This acidity of the soil can be corrected by using applications of lime or wood ashes.

### AVAILABILITY OF PLANT FOOD IN SOILS.

Since 1896 the writer has been studying the availability of plant food in arable soils. Thus far 187 pot experiments have been conducted. During the season of growth each pot was photographed twice. In order to make the investigation at all complete, it will be necessary to conduct a few more pot experiments and accumulate a little more data, after which the writer hopes to publish the results of the work.

This work may appear to be of technical or scientific value only, but if a method can be worked out by means of which we can determine the availability of the plant food in arable soils, it will be one of the most practical things we have yet accomplished in agricultural investigations. Work of this nature necessarily requires some greenhouse room, and it is hoped that in the near future we may acquire a little more greenhouse room.

### EXPERIMENTS WITH FERTILIZERS AND PRUNES.

In certain parts of this State the prune industry is of considerable importance and a study of the prune has been begun.

The use of a five acre prune orchard, both naturally well drained and tile drained, has been obtained for a number of years.

The Chemist has begun a study of the effects of fertilizers upon the quality and quantity of the prunes grown. In addition to the ordinary commercial fertilizers, Gypsum (land plaster), disintegrated granite, and wood ashes are being used. The work on the prune orchard is to extend over a number of years, and it will probably be two or more years before any results or effects of the fertilizers will be shown.

In connection with the orchard work on prunes the various methods of drying prunes will be studied. For this purpose driers are being constructed this summer. This fall the conditions existing during the process of prune drying will be studied. The cured prune will also be studied, the object being to ascertain those conditions which influence the quality of the cured prune, and also to find out as nearly as possible what the ideal conditions are in order that the cured prune will be of the best quality and will keep indefinitely.

### APPLE ORCHARDS AND POTASH.

There is quite a common notion in many parts of the State that old apple orchards become stunted and lack vigor because the trees have robbed the soil of its potash. A study and comparison of soils from old apple orchards and from adjacent fields will be started just as soon as we obtain the samples, in order to find out just how much truth there is in this common notion. In the writer's opinion, thorough tillage and an improvement in the texture of the soil would go a long way toward substituting this supposed lack of potash.

### CONSERVATION OF MOISTURE IN SOILS.

The question of the conservation of moisture in the soil is one of great importance, especially in regions where the rainfall is but a few inches annually. Plat experiments are being carried on at Moro in eastern Oregon. Four systems of rotation are being conducted on different plats; one object of these experiments being to ascertain which system of rotation will conserve and use most profitably the scanty rainfall of eastern Oregon. During a period extending from April to the latter part of September, samples have been obtained weekly from each of these plats and moisture determined in each individual sample. This work has been carried on for three years and it is to be continued for some time to come.

### CHEAT AS A FORAGE PLANT.

Considerable work has been done upon cheat, in order to ascertain its value as a forage plant, and it is hoped that the results of this work will be published in the near future.

### A STUDY OF THE LUPINE PLANT.

The lupine is a leguminous plant. As a general thing it may be said that all leguminous plants possess the power of assimilating and fixing atmospheric nitrogen. It is known that the nodules which exist on the roots of this class of plants are the parts which perform this function. Many times we are asked whether these nodules are any richer in nitrogen than other parts of the plant. In order to solve this question, lupine plants were carefully dug up at different periods of their growth and careful analyses made of the different parts of the plants. The results of these analyses may be summed up in the following table:

ANALYSES OF DRY MATERIAL (WATER-FREE SUBSTANCE) FOR TOTAL NITROGEN

| | No. 1841. Full bloom August 20, 1900. | No. 1851. Pods well formed October 11, 1900. | No. 1861. Pods very large October 26, 1900. |
|---|---|---|---|
| Leaves | 4.02 per cent. | 3.70 per cent. | 3.41 per cent. |
| Pods | 3.07 per cent. | 3.38 per cent. | 3.68 per cent. |
| Stems | 1.15 per cent. | 0.88 per cent. | 0.90 per cent. |
| Roots | 0.92 per cent. | 0.83 per cent. | 0.66 per cent. |
| Nodules | 5.17 per cent. | 4.29 per cent. | 3.70 per cent. |
| | Dry matter in parts of plants when pulled. | | |
| Leaves | 18.31 per cent. | 16.49 per cent. | 19.43 per cent. |
| Pods | 12.58 per cent. | 12.44 per cent. | 15.53 per cent. |
| Stems | 18.21 per cent. | 24.83 per cent. | 25.55 per cent. |
| Roots | 21.89 per cent. | 26.39 per cent. | 26.74 per cent. |
| Nodules | 18.25 per cent. | 14.33 per cent. | 13.51 per cent. |

An examination of the foregoing table shows that the nodules are excessively rich in nitrogen, especially when the plants were in full bloom and making rapid growth. At this period of growth the dried leaves contained 4.02 per cent nitrogen; the pods, which were just forming and few in number, 3.07 per cent nitrogen; the stems, 1.15 per cent; the roots, 0.92 per cent, whilst the nodules fastened to them contained 5.17 per cent of nitrogen.

### SYSTEMS OF CROP ROTATION.

It is well known that the soil becomes "tired" of producing the same kind of crop year after year, and in order to obviate this, some system of crop rotation must be followed. Many farmers in this State follow the plan of "grain and summer fallow." This practice is almost suicidal, since the grain is constantly taking away fertility from the land, and the summer fallow oxidizes and destroys the humus.

Many farmers in this State still firmly believe in the summer fallow system—a system which has been practically abandoned in many of the older portions of the farming world, because it has been found to be more injurious than beneficial.

In connection with the foregoing thought, the Agricultural and Chemical Divisions of the Station have planned and laid out four plats of one acre each upon land of as nearly uniform character as it was possible to find. Upon these four one-acre plats, four different systems of crop rotation will be practiced. The summer fallow system will be compared with three other systems. The object of this work being to ascertain which system of crop rotation is best adapted to our climate and soil conditions. A careful account of all receipts and expenditures will be kept for each plat. The

chemical and physical conditions of the soil of each plat will be studied yearly in order to learn which system of rotation is preferable.

### DRAINAGE EXPERIMENTS.

In regions where the rainfall is excessive there is necessarily more or less leaching of the soil. These leachings carry certain amounts of plant food, and it is important to find out, if possible, how to handle the soil in order that the leachings from it will carry the minimum amount of plant food. For this work four pots were made of heavy galvanized iron, each pot being two feet in diameter and 2½ feet deep, and so constructed that it would drain perfectly and the drainage water collect in a receiver placed underneath. Each pot is being handled in a different way. One with the popular summer fallow system, the others with different systems of crop rotation. The drainage water from each pot is carefully measured and analyzed in order to ascertain just how much plant food leaches out of each pot. In this manner we shall be able to find out which system is best; which causes the maximum loss and which the minimum loss of plant food in the leachings. At the beginning of this investigation the soil in all pots was uniform. This work will be continued several years.

### MISCELLANEOUS ANALYSES.

In a laboratory of this kind there is always a large amount of work which is of a miscellaneous character. Under this head might be placed such work as that required by the State Dairy and Food Commissioner and work which is sent in from various parts of the State. Much of this work has no scientific value attached to it, but must receive careful attention and consumes considerable time.

### ANALYSES MADE DURING THE YEAR.

In order to give an idea as to the amount of Station work which has been performed during the year, the following table is appended:

| | |
|---|---|
| Number of determinations of moisture | 148 |
| " " solids (by difference) | 65 |
| " " ash | 67 |
| " " protein | 148 |
| " " crude fibre | 42 |
| " " ether extract | 44 |
| " " nitrogen free extract (by difference) | 28 |
| " " acidity in silage | 70 |
| " " acidity in vinegar | 26 |
| " " nitrogen in soils | 16 |
| " " potash | 35 |
| " " phosphoric acid | 21 |
| " " humus | 6 |
| " " preservatives | 65 |

| | | |
|---|---|---|
| Number of determinations of | cane sugar | 15 |
| " " | glucose | 6 |
| " " | starch | 12 |
| " " | color materials (dyes) | 7 |
| " " | casein | 6 |
| " " | fat | 5 |
| " " | volatile fatty acids | 2 |
| " " | sulfur | 3 |
| " " | chlorine | 8 |
| " " | free ammonia | 8 |
| " " | albuminoid ammonia | 5 |
| " " | arsenic in Paris green | 3 |
| " " | copper | 8 |
| " " | gold and silver | 18 |
| " " | zinc | 1 |
| " " | lead | 1 |
| " " | calcium | 1 |
| " " | sulfuric acid | 1 |
| " " | gluten | 2 |
| " " | volatile matter | 2 |
| " " | fixed carbon | 2 |
| Total | | 898 |

APPARATUS ACQUIRED.

During the year the Chemical Division of the Station has been fortunate in obtaining some fine pieces of apparatus which were essential for careful and accurate work. We have obtained one of the best Staudinger balances from Thomas, Philadelphia. This balance has a capacity of 200 grams and is guaranteed to be sensitive to $\frac{1}{100}$ of a milligram ($\frac{3}{10,000,000}$ of an ounce) when carrying a full load. We have acquired one copper condensing tank for the distillation of nitrogen, and one complete ether extraction apparatus with a capacity for making twelve simultaneous determinations; also one portable blast lamp. Besides the foregoing, we have acquired numerous small pieces of apparatus which are essential and necessary to a well equipped laboratory. I think we can safely say that we have one of the best equipped laboratories in the northwest.

Respectfully submitted,

A. L. KNISELY.

## REPORT OF THE ENTOMOLOGIST.

*Dr. James Withycombe, Vice-Director:*

I hereby present for your consideration a brief synopsis of the work of the Department of Entomology and Plant Diseases for the year ending June 30, 1901.

From an entomological standpoint the year was rendered noteworthy by the widespread and destructive outbreak of the variegated cut-worm, *Peridroma saucia*, which occurred in June and July throughout the greater part of western Oregon as well as Washington and British Columbia. Opportunity was taken of this outbreak to clear up some debated points in the life-history of the species. A bulletin on the subject is being prepared.

The general failure of the wheat crop throughout the Willamette valley last season was generally attributed to insect pests. Considerable time, therefore, was devoted to ascertaining the distribution of and the amount of injury being done by the various pests which were actually found to be present. Of these the three principal ones were the Hessian-fly, the joint-worms and the grain-aphis.

Through co-operation with Mr. J. B. Irvine and Mr. Thomas Whitehorn, both of Corvallis, who placed their orchards at my disposal for the work, a successful experiment in spraying for the codling moth was completed. That this insect can be controlled by proper spraying even under the extremely unfavorable conditions which prevail in various parts of the State, has been demonstrated over and over again, not only by our own experiments but by the practice of the most successful apple growers. Nevertheless it was thought best to repeat the experiments on a larger scale in view of repeated statements of horticulturists and entomologists that spraying for the codling moth is not successful where there are two or more annual broods of the insect The results will appear in a bulletin on the codling moth which is now being prepared.

The work on apple tree anthracnose, which was begun two years ago, has been continued. A number of trees free from the disease were obtained from an eastern Oregon nursery and experiments have been undertaken to prevent them from becoming infected. Notes on the distribution of the disease and its effect on different varieties have been collected, pure cultures have again been ob-

tained and from these a considerable number of young trees were inoculated with the result that in every case a virulent type of the disease was produced. In connection with this work some attention has also been given to another very similar disease of apple bark which seems to be due to an entirely different fungus. Certain varieties of apples in the college orchard, as well as in the orchard of Mr. Whitehorn, were much disfigured by a peculiar "russetting" of the surface. When the injury was first noticed I was inclined to think it had been caused by the application of too strong sprays. Later in the season, however, the injury was observed to be quite common throughout the valley, even in orchards that had not been sprayed. Careful examination failed to reveal any bacteria or fungi to which the trouble could be attributed, and I was forced to the conclusion that it was caused by frost at blossoming time or shortly after. Such injury is not unusual in the east, but I have not before observed it in this State.

As usual a large number of specimens were determined for correspondents, and short notes were taken on the biology of a large number of species both of insects and fungi. Of those which were of more than passing interest, either from the fact that they were more than ordinarily abundant, or from the fact of their first recorded appearance in the State, may be mentioned the bud moth, the strawberry root-weevil, crown-gall, onion mildew, gooseberry mildew and horn fly.

During the year my private collection of Arizona insects, numbering several thousand named specimens, has been incorporated with the Station collection, and several hundred named species have been added by exchange and identification.

Respectfully,

A. B. CORDLEY.

## REPORT OF THE BOTANIST AND HORTICULTURIST.

*To Dr. James Withycombe, Vice-Director of Experiment Station:*

Dear Sir:—I beg to submit the following brief report of the principal lines of work being conducted at present by this division:

The work of the division for the past year was materally checked by my absence during the summer and autumn of 1900. As a result of this absence, however, we have secured trees and scions of at least sixty varieties of foreign orchard fruits. The work of the year is likewise marked by the beginning of investigations upon poisonous plants, and the introduction of aphis-resisting apple stocks from Australia, all of which has been in conjunction with the National Department of Agriculture.

### HORTICULTURE.

Protecting Sheaths.—The test being made to ascertain the efficiency of protecting sheaths as used about the trunks of newly set orchard trees is progressing as favorably as the limited orchard space at our command will permit. While the original plan contemplated an exhaustive test of sheaths made of paper, fibre and other materials, the quantity of new trees planted during the past three years has only been sufficient to permit of the use of two classes of sheaths,—basket veneering, and yucca fibre; of these two kinds of sheaths, one hundred of each were placed about yearling trees, apples, pears, plums and prunes planted in March and April of 1900. At this date only twenty per cent of the veneer sheaths remain intact, and several of the lot have been tied in place two or three times; of the yucca sheaths 89 per cent are in place. While the cost of thirty inch veneer sheaths is about and cent a piece, yucca sheaths of the same length cost nearly seven times as much, yet the latter are the cheaper in the end and much more efficient. It is hoped that more new plantings at an early date will permit of carrying out the full test as originally contemplated.

So far as the observations have gone the temperature inside the sheaths as compared with that outside is, one day with another, about the same; generally a slightly higher temperature prevailing inside the sheaths during the heated term, and a slightly lower tem-

perature during the cold season.* With sheaths of other material these conditions might be changed. The usually clean, unblemished conditions of the trunks that have been protected would appear to indicate that the chief benefits to be derived from sheaths is protection from the direct rays of the sun, winds, and violent changes in temperature.

Variety Tests.—The test of orchard and garden varieties which is being continued and enlarged from year to year is a source of much interesting information as to relative hardiness and vigor, and in a few years more will have furnished data sufficient for some valuable deductions along these lines. The eliminations made during the past few years would appear to indicate that the Japanese varieties of both pears and plums, and also many of the American hybrids are quite unfit for our Willamette valley conditions.

A test now covering a period of ten years adequately proves that the conditions under which the college vineyard exists are wholly unsuitable for successful grape growing; even American varieties barely mature and ripen a few clusters in the most favorable seasons, while the foreign varieties mature none. Growth of vine in both cases is fairly good, and only a trace of mildew has been observed.

New or Little Known Varieties.—In accordance with the scheme of work laid out in 1898 there have been introduced into the station orchard (largely by grafting into the established trees) during the past three years; apples, 90; pears, 16; cherries, 6; plums and prunes, 63; peaches, 3, together with a considerate number of varieties of nuts and small fruits. Of these, five varieties of apples are fruiting this year. The plums and prunes being of this year's introduction and of necessity budded to nursery stock, fruit can not be expected for at least two years yet. This material affords a quite liberal supply of varietal wood upon which to work along the lines of cross-pollination and selection.

Plant Breeding.—Last year witnessed the planting of nearly forty varieties of "pedigree trees," most of them obtained from Rogers Bros. of New York. With a very few exceptions these trees are doing well. This is the first planting of "pure blood" trees in this state so far as any published statement has been made. It is a substantial beginning in the line of work indicated above. In

* Regular observations were taken between 12 M.–2:30 P. M. each day during a period of one month in summer, and one month in winter.

order to make this a widely interesting feature of the station work it is proposed to distribute wood of these varieties to those who may be interested in studying pedigree stock. In this same line is the work of cross-pollinating, which has been temporailly suspended. Our climatic conditions work against successful manipulation upon standard trees. They are too unwieldy. In order to carry this work forward with due efficiency a quantity of dwarf stock must be provided and to this end some material is already in hand for work the coming season.

Hardy Stocks.—The subject of "stocks" for both the cherry and the apple has been for many years one of moment to the Oregon orchardist. In order to render some aid in this matter there has been procured through the National Department of Agriculture over twenty varieties of aphis-resistant apples from Australia. For the purpose of identification material has already been grafted into the established trees in the station orchard. Stocks of these trees will be put out this fall. From some of our leading orchardists have been obtained pits of specially hardy, clean, vigorous seedling cherries, these, together with material from seedlings now on the grounds, will furnish material sufficient for a quite exhaustive test of this subject.

Root Pruning.—Two years ago twenty-four yearling trees of waxen apples were set in a single row, every alternate tree was root and top pruned according to the "Stringfellow method," the others were root pruned and tops cut back to 30 inches. Of these trees it is impossible to select the one set from the other, except by taking note of the place of union of new growth; in the one set the union is near the ground,—about six inches above the surface,—while it is 30 inches in the other. For the purpose of a check one tree of the same lot as they came from the nursery was set without either top or root pruning. The unthrifty appearance of this tree as compared with the others, though it has had the same tillage is so evident that none can fail to mark the force of the position taken, *i. e.*, that thorough pruning at the time of setting out is an all important part of orchard work.

Whole and Piece-Root Grafting.—Some four or five years ago when this topic was receiving much attention by the horticultural societies and journals the college received from the National Department of Agriculture grafts of eleven varieties of apples, scions of each being upon (1) a whole root, (2) a bottom cut, (3) a top cut.

Through the various changes in the management of the orchard resulting in loss of records, and in the death of a few of the trees, there appears to be only one variety that can be definitely located as complying with, and completing the test up to date, and that is Summer Wafer; in this case the whole root and top cut have made a decided gain in growth over the bottom cut, while as between the first and second there appears to be a slight advantage in favor of the first. With so limited a quantity of known material no reliable conclusions can be drawn, for individual character plays an important part and a test should embody so many individuals that this feature is practically eliminated.

Fruit Preservation.—The problem that has, more than any other one, engrossed the attention of the horticultural people of this state is the one pertaining to the evaporation of the prune. In order to solve a few of the troublesome points in this problem there is now being erected upon the station grounds a small building to be used as an experimental evaporator, store-house and laboratory for the investigation of the various methods relating to the preservation of fruit and the utilization of the secondary products of the orchard. This work promises to be an interesting feature of the horticultural investigations, of not only this year but of several years in the future.

## BOTANY.

The Clovers.—The importance of the clovers in agriculture is recognized by every intelligent agriculturist. The fact that Oregon has within her borders at least (27) native species and varieties of this plant, more than on any other corresponding part of the globe, would seem to indicate that nature has here found the conditions just right for the development of this type of leguminous plants. It is evident therefore that the native clovers ought to receive some considerable attention at our hands and there has been made even now a considerable collection of the more common species, and the work of collecting a large quantity of the seed of the various varieties in order to bring them into cultivation is being pushed at the present time.

The Grasses.—A feature of our field work that would be exceedingly interesting, and at the same time furnish much valuable data, would be a grass garden devoted to the native grasses and forage plants. Anticipating the establishment of such a garden, we have

begun the collection of seed of the native grasses, and it is hoped that some suitable piece of ground may be set aside for this purpose, and that work upon it may be begun during the present year.

The Hosackias.—A study of the Hosackias (plants closely allied to the clovers) of the State is also under progress. These plants have a varied habit and possess the nitrogen-forming tubercles, and have pods similar to those of the ordinary cultivated pea or bean but very much smaller. For some reason stock do not eat freely of these plants, accordingly an effort will be made to ascertain why they are objectionable, and if the undesirable qualities can be eliminated by cultivation. To this end, as in the case of the clovers, seeds are being collected for the purpose of putting the plants under cultivation.

Poisonous Plants.—A study of the plants of the state reputed to be poisonous to stock, especially sheep, was commenced this spring in conjunction with the National Department of Agriculture. It is expected that the investigations will cover several years, though a preliminary report of the work done this year will be published shortly.

Respectfully submitted,

E. R. LAKE.

## REPORT OF THE FLORICULTURIST AND GARDENER.

*To Dr. James Withycombe, Vice-Director of Experiment Station:*

DEAR SIR:—I have the honor to report to you on vegetable gardening during the summer and fall of 1900 and the spring of 1901.

During the spring of 1900 there were fifty-five varieties of vegetable seeds sown in the experiment plats, most of which were received from the Department of Agriculture. Notes were taken of each variety through the season. Seed was saved of those that showed signs of any value and they were given another trial this year before reporting finally upon them. Those that could be reported upon were duly reported to the Department of Agriculture at the end of the season. Such varieties as Broccoli, that have withstood the winter, have been encouraged to produce seed, also the same with varieties of cabbage. By this means I hope to find some varieties of Broccoli that will withstand our winters and thereby give us varieties of value to our list of winter vegetables. Most varieties of Broccoli are too tender for this climate, therefore I deem it of much importance that we should do our best to improve such varieties that show any signs along the line mentioned. I have several varieties on the grounds producing seeds, therefore I hope in two or three years from now to be able to report good results from these experiments.

ONIONS.—Last summer and fall I experimented in onion culture for the purpose of determining if there was an advantage to be derived from the so-called new onion culture (a very old practice, though). For this purpose I sowed seed of the same varieties in the open ground and also in boxes in greenhouse. As soon as the young plants were large enough they were pricked off into other boxes. By this means the young plants were quite strong when planted out on April 10th. They were planted in rows alongside of those sown in open. Both made good growth. Those planted out from boxes matured well, the bulbs being of even size, not over large but a good commercial product. Of those sown in the open, some made a fair growth although they never matured well. It was impossible to dry them off and on this account the keeping qualities were not good. I experimented with both for the purpose of determining which of the two systems of cultivation was most

favorable for their keeping qualities. For this purpose they were layed out side by side and given the same treatment in the way of temperature and air. Those that were sown in open ground soon began to show signs of growing and by the middle of December were nearly all sprouted. Those that were planted out from boxes showed no signs of growth during the winter, not until the middle of April and then only a few began to show signs of growth. Thus by this single test it goes to show that the preference is given to the raising of the plants in boxes and planting out for the best keeping qualities of this product in this locality. I have continued to experiment along the same line this year. The plants are looking well at this time and I hope to have good results. I have taken other varieties this year for continuing this experiment and by so doing shall be able to decide on varieties as well as manner of cultivation.

Tomatoes.—These were planted out quite extensively, but for some reason none of the varieties did very well. The only variety that amounted to anything was the "Kansas Beauty." I attribute the failure to the following: During the early spring the ground had been dug up while very wet and the continued rains after this packed the soil which never collected heat enough during the summer. Although the surface was continually stirred the soil below was in a very clamy condition the whole season.

Cabbage.—Several hundred of these plants were set out May 5, 1900. These made excellent growth up to the middle of June when they were all eaten up by our neighbor's hog. Having no gates to the grounds it is almost impossible to keep stray stock from damaging us very often. Cauliflower plants went the same way.

Swiss Chard.—There were four varieties of this vegetable grown on the grounds during 1900. All did well but were not of much value as a vegetable in this locality as people have not become acquainted with the way of using it for culinary purposes. The plant is valuable for the decoration of flower borders for which purpose it has been used for many years past. There are but few who appreciate it for cooking. In short, there is not much demand for it in our markets.

Beans.—There were eleven varieties of beans grown last year. Namely, four varieties of the Broad Windsor. The seed was received from the Department of Agriculture, having been received originally from Italy. These varieties are not much sought after except by

Europeans. Each did well and are very prolific here, being free from pests and quite hardy. I should think by a careful test they might be grown to great advantage for hog feeding, as these animals thrive well when not fed too heavily with them. Horses also are fond of them and are greatly stimulated by them when they have heavy work to perform. Feed half a pint per day.

There were seven other varieties grown, such as the string bean. Out of this number two were found to be of some value. The others did not amount to much. But to prove them we have sown seed of them again this year, so by giving them another test shall be better prepared to report upon them next year.

Vegetable Marrow.—Of these five varieties were received from the same source as above. These came from Italy also. Although each packet was numbered differently, the product was the same. These are the summer squash of our market. Have replanted seed of them this year also.

Chicory.—This made an excellent growth, showing that this climate is well adapted to its cultivation. It may be used as a salad, the same as Endive, by blanching the leaves, either by tying them up together when they are quite dry, or by covering them up some way to exclude the light. Taking the plants up in the fall and placing them in a dark room or cellar will have the desired effect of blanching. When this is done it is hard to distinguish from Endive.

Radish. –Three varieties of these were grown, namely, Everlasting, Summer and Long Olopuka. The first named made good growth, but from the first to last was so strong and peppery that it was impossible to use them to any advantage. The roots were large, penetrating the soil to a depth of twelve to fifteen inches.

The Summer radish did not differ materially from the Everlasting, only maturing a few weeks earlier. This, also, was very strong to the taste, especially after maturity.

New Olopuka, a large white radish, resembling the Chinese White Winter, like the two foregoing, was very strong and peppery, which made it unfit for table use. I attribute this to the slow growth during the summer.

Lettuce.—Seed received from Atlee Burpee & Co. This variety was imported from France by the above firm. Plants produced small heads, very solid, resembling the "tennis ball" lettuce. A good winter variety as well as summer on account of its hardiness.

Peas.—Two varieties were sown, namely, "Yorkshire Hero" and "Champion of England." Both of these are old well tested varieties. The former, a most excellent pea, is a great producer and of high flavor, requiring no supports. The latter is also one of high quality and produces well. It is a late season pea but to do well requires supports five feet in height.

Kale.—Longstanding, one variety received from Deere, proved to be quite hardy and valuable as a winter and spring green, as the plant stands a long time before going to seed, thus giving it a long season for a spring vegetable.

Tobacco.—Sixteen varieties were sown. When matured all were turned over to the care of Professor Pernot for his experiments.

Hops.—During the month of April there were ten varieties of Bohemian hops planted out, the sets having been received from the Department at Washington for experimental purposes. All are doing well at this date. The young plants have all been staked so that no harm can come to any of the vines by wind. The reason for planting so far away was to get as much out of the way of the heavy sea breeze as possible as the winds are detrimental to the growth of the hop vine on account of the constant whipping of the leaves.

In addition to the above there have been two samples of hop seed received from the Department of Agriculture. One package of this seed was perfectly worthless from the fact of its being ground up in transit. The package of apparently good seed was sown in pots at the beginning of May but so far has failed to germinate.

Orchards.—Owing to the absence of Prof. E. R. Lake in the east, Doctor Withycombe, Vice-Director, placed the care of the fruit under my charge. All the fruit, such as apples and pears, was gathered and stored away and a strict record kept during the season as to the keeping qualities and also as to flavor, etc. A room was set apart as a storeroom in the old cottage, which answered fairly well for the purpose as we did not have any very hard freezing weather. Notes were kept on about sixty varieties. Those that were thought to be of no value as keepers were sold from the trees to the boys' dormitory, thus saving the time of handling them.

A record was kept on about seven varieties of pears. Some of these, like the above, proved valuable varieties.

There have been planted on the experimental vegetable grounds nineteen varieties of flower seeds for testing their adaptability to

this climate, and fifty-seven varieties of vegetables. These have been received from different seedmen for testing as to earliness, productiveness, vigor, value for culinary purposes. Notes will be taken during the season and a report rendered as soon as the season has closed.

Respectfully submitted,

GEORGE COOTE.

## REPORT OF THE BACTERIOLOGIST.

*To Dr. James Withycombe, Vice-Director of Experiment Station:*

SIR:—I herewith submit the following condensed report of work done in the department of bacteriology during the year ending June 30, 1901.

The major subjects have been the investigations of diseases in poultry and the smutting of cereals. A preliminary bulletin, No. 63, was issued in November, setting forth the results of experiments on the prevention of smut in oats by dry heat, with comparative tests of other methods in vogue.

In December, bulletin No. 64, on the Diseases of Poultry, was issued, in which the results of investigations upon that subject were recorded. The work on these two subjects will be continued until the investigations are completed when a full report will be made.

During the middle of the winter a great deal of time and labor were spent in investigating diseases of sheep which were caused apparently by pathogenic germs. In all the dead sheep which were investigated, and the sheep which were killed in the last stages of the disease, no leisons were found which could be responsible for the death of the animal, excepting a bacillus somewhat resembling anthrax, which was found in every case in the liver and gall ducts. Guinea pigs inoculated with pure cultures of these germs, died within 24 to 36 hours and the germs were recovered principally from the liver. Experiments in inoculating sheep subcutaneously, and inoculating and feeding rabbits with pure cultures, all gave negative results. Whether the loss of sheep is primarily caused by this germ or whether it is a secondary result in sheep which have not been properly fed and cared for, has not yet been determined but the work of investigation will continue until definite conclusions are obtained.

The investigation of the effect upon wool by cross breeding sheep was continued during the year and a great many samples of wool were examined, measured, photographed under the microscope and lantern slides made for the purpose of illustrated lectures. Experiments were also conducted in dipping sheep with dips of different strengths for the purpose of studying the effect produced upon the wool fibre.

During the Fall of 1900 a disease was noticed in the large cut worms which made their appearance here during the Summer and upon examination small germs were found to be the cause of their destruction; pure cultures were made of these germs with a view to establishing a similar disease in the codling moth larvæ. The laboratory experiments so far have demonstrated that the germ is pathogenic to cut worms and wasps. Small lumps of sugar saturated with pure cultures of these germs caused death to wasps in 24 to 35 hours. The germs were recovered from their bodies. Cut worms under a glass bell jar, fed upon young tender grass, which had been dipped in pure cultures of these germs, died in about 24 hours. Tent caterpillars, after eating rose leaves that had been moistened with these germs mixed with water, died in 48 hours or less.

The cultures used were old, having been grown from generation to generation for one year, materially lessening their virulence. The action of the germ on tent caterpillars is identical with that on the cut worm; their posterior extremities seemto decompose and at that point great masses of the germs may be found.

Experiments in cider vinegar were conducted on a small scale during the Fall of 1900. A pure cider vinegar containing a four per cent acetic acid and of an excellent flavor, was produced in three month's time by means of double inoculation with pure cultures. Vinegar made in the same manner, one year old, analyzed 5.55 per cent acetic acid, which is a remarkably high percentage. This vinegar, although so acidulous, retained the flavor of the fruit which made it a very palatable article.

In the disease of stock a great many pathological specimens have been received from the State Veterinarian and from stock owners. The only new disease of importance found was a case of infectious pneunomia which had broken out among calves. All the other specimens proved to be from diseases which the department had previously worked out.

At the present writing a quantitative bacterial analysis is being made of milk every alternate day. Plate cultures are made with one c.c. each of normal milk, milk which has been separated and mixed again, pasteurized milk and slime from the separator.

This work is being carried on in connection with the department of dairying to determine the relative amount and kind of acid formed in milk under these conditions in a given time.

Respectfully submitted,

E. F. PERNOT.